Small Business Innovation Research/Small Business Tech Transfer

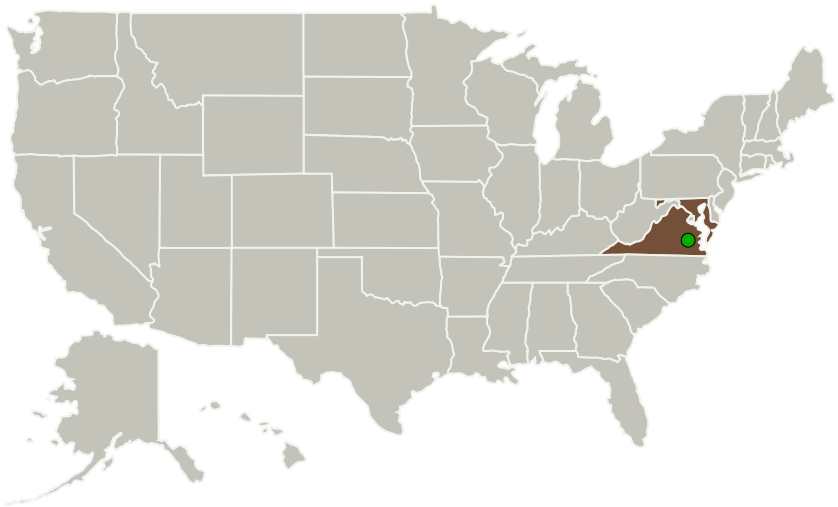
An Ultrasonic Wireless Sensor Network for Data Communication and Structural Health Monitoring, Phase I

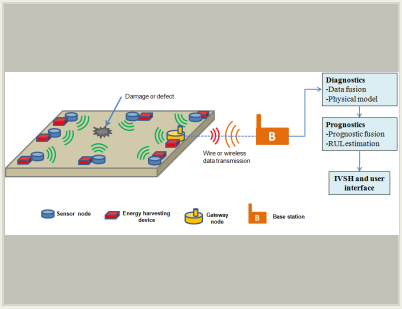
Completed Technology Project (2017 - 2018)

Project Introduction

Typical Structural Health Monitoring (SHM) uses embedded ultrasonic transducers exclusively for non-destructive evaluation (NDE) purposes, whereas data transfer is performed over separate wireless radio frequency (RF) links. Ultrasonic systems, however, are also effective as a communication technology, and in fact may prove to have crucial advantages over RF-based sensor networks in certain scenarios. In this proposal, X-wave Innovations, Inc. (XII) and University of Maryland Easton Shore (UMES) outline an innovative Self-powered Ultrasonic Wireless Sensor Network (SUWSN) technology, which performs simultaneous NDE and wireless data communication. Our communication approach is based on a special modulation technique that mitigates the dispersive nature of the ultrasonic channel and allows the simultaneous determination of structural health. For the Phase I program, we will prototype a SUWSN system and demonstrate the feasibility of the proposed technique for simultaneous data communication and NDI/SHM. For the Phase II program, we will focus on refining the SUWSN prototype system design and development with improved hardware and software. For the Phase III program, XII will focus on optimizing the SUWSN performance and collaborating with our commercial partners to improve and package the SUWSN technology into a turnkey commercially-available system.

Primary U.S. Work Locations and Key Partners





An Ultrasonic Wireless Sensor Network for Data Communication and Structural Health Monitoring, Phase I Briefing Chart Image

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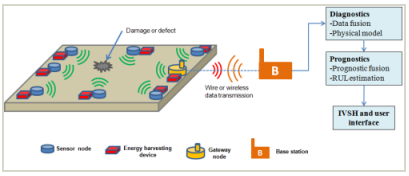
Organizations Performing Work	Role	Type	Location
X-wave Innovations	Lead Organization	Industry Women-Owned Small Business (WOSB)	Gaithersburg, Maryland
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
University of Maryland Eastern Shore	Supporting Organization	Academia Historically Black Colleges and Universities (HBCU)	Princess Anne, Maryland

Primary U.S. Work Locations	
Maryland	Virginia

Images



Briefing Chart Image
An Ultrasonic Wireless Sensor Network for Data Communication and Structural Health Monitoring, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/136662)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
X-wave Innovations

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

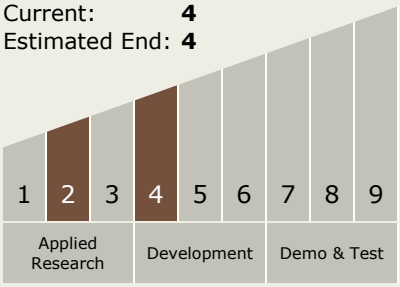
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Carlos Rentel

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.3 Reliability and Sustainment

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System